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Beaver Valley Power Station, Unit No. 1
Docket No. 50-334 License No. DPR-66
LER 2001-001-00

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

In accordance with Appendix A, Beaver Valley Technical Specifications, the following Licensee Event Report is submitted:

LER 2001-001-00, 10 CFR 50.73(a)(2)(iv), "Manual Reactor Trip Due to Loss of Station Instrument Air."


Lew W. Myers

Attachment

IED2

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

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FACILITY NAME (1)

Beaver Valley Power Station Unit 1

DOCKET NUMBER (2)

05000334

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TITLE (4)

Manual Reactor Trip Due to Loss of Station Instrument Air

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|--------------------|-----|------|---|-------------------|--------|--------------------|-----|------|-------------------------------|--|
| MO | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO | MO | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| 06 | 22 | 2001 | 2001 | - 001 | - 00 | 08 | 13 | 2001 | None | |
| OPERATING MODE (9) | | 1 | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11) | | | | | | | |
| POWER LEVEL (10) | | 100% | 20.2201(b) | | | 20.2203(a)(3)(i) | | | 50.73(a)(2)(i)(C) | 50.73(a)(2)(vii) |
| | | | 20.2201(d) | | | 20.2203(a)(3)(ii) | | | 50.73(a)(2)(ii)(A) | 50.73(a)(2)(viii)(A) |
| | | | 20.2203(a)(1) | | | 20.2203(a)(4) | | | 50.73(a)(2)(ii)(B) | 50.73(a)(2)(viii)(B) |
| | | | 20.2203(a)(2)(i) | | | 50.36(c)(1)(i)(A) | | | 50.73(a)(2)(iii) | 50.73(a)(2)(ix)(A) |
| | | | 20.2203(a)(2)(ii) | | | 50.36(c)(1)(ii)(A) | | X | 50.73(a)(2)(iv)(A) | 50.73(a)(2)(x) |
| | | | 20.2203(a)(2)(iii) | | | 50.36(c)(2) | | | 50.73(a)(2)(v)(A) | 73.71(a)(4) |
| | | | 20.2203(a)(2)(iv) | | | 50.46(a)(3)(ii) | | | 50.73(a)(2)(v)(B) | 73.71(a)(5) |
| | | | 20.2203(a)(2)(v) | | | 50.73(a)(2)(i)(A) | | | 50.73(a)(2)(v)(C) | OTHER |
| | | | 20.2203(a)(2)(vi) | | | 50.73(a)(2)(i)(B) | | | 50.73(a)(2)(v)(D) | Specify in Abstract below or in NRC Form 366A |

LICENSEE CONTACT FOR THIS LER (12)

NAME

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(724) 682-5203

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
| B | LD | FCV | AquaMatic | Y | | | | | |

SUPPLEMENTAL REPORT EXPECTED (14)

| | | |
|--|---|----|
| YES (If yes, complete EXPECTED SUBMISSION DATE). | X | NO |
|--|---|----|

EXPECTED
SUBMISSION
DATE (15)

MONTH

DAY

YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 22, 2001, at approximately 0924, Beaver Valley Power Station Unit No. 1 received an alarm for Station Instrument Air Receiver Tank Discharge Pressure Low. Operators entered the Abnormal Operating Procedure and initiated action for Loss of Station Instrument Air. At 0930, the degrading instrument air pressure caused an air-operated isolation valve in the cooling water flow path to two Reactor Coolant Pumps (RCPs) to close, eliminating component cooling water flow to these RCPs. At 0931, the reactor was manually tripped due to the loss of cooling to two RCPs and the potential loss of cooling water to the third RCP. All RCPs were then secured and natural circulation was established in the Primary System. All control rods fully inserted into the reactor core and all required safety systems operated as designed. Emergency Operating Procedures for Reactor Trip were performed and the plant was stabilized in Mode 3. The initiation of a manual reactor trip is reportable pursuant to 10 CFR 50.72 (b) (2) (iv) (B) and 10 CFR 50.73 (a) (2) (iv) (A).

The root cause of the rapid Instrument Air System depressurization was mechanical aging/cyclic fatigue of the spring in a blowdown valve associated with the air dryer for the Instrument Air System. This failure caused the output from the operating air compressor to be vented off rather than entering the Instrument Air System Receiver Tank, resulting in an Instrument Air System breach. The safety significance for this event was small.

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PLANT AND SYSTEM IDENTIFICATION

Westinghouse-Pressurized Water Reactor System
Reactor Coolant System Pump (AB)
Reactor Building Component Cooling Water System (CC)
Station/Instrument Air System (LD)

CONDITIONS PRIOR TO OCCURRENCE

Unit 1: Mode 1 at 100 % power

There were no systems, structures, or components that were inoperable that contributed to the event.

DESCRIPTION OF EVENT

On June 22, 2001, at approximately 0924, Beaver Valley Power Station (BVPS) Unit No. 1 received an alarm for Station Instrument Air Receiver Tank Discharge Pressure Low. Following Abnormal Operating Procedure AOP 1.34.1 for Loss of Station Instrument Air, operators were dispatched locally where they identified that instrument air pressure was 95 psig and decreasing due to air blowing down from the Instrument Air Dryer 1IA-D-1. Additional instrument air system related alarms were also received. It was noted that the standby redundant system air compressor, which normally automatically starts on a low pressure condition, was not operating. At about 0930, the degrading instrument air pressure caused an air-operated isolation valve in the cooling water flow path from two Reactor Coolant Pump motors (RCPs) to close. This eliminated component cooling water flow to these RCP motors and thermal barriers. However, seal injection to the RCP seal package was maintained throughout the event.

At 0931, the reactor was manually tripped due to the loss of cooling to two Reactor Coolant Pumps and the potential loss of cooling water to the third Reactor Coolant Pump. All Reactor Coolant Pumps were then secured and natural circulation was established in the Reactor Coolant System. All control rods fully inserted into the reactor core and all required safety systems operated as designed. Emergency Operating Procedure E-0 for Reactor Trip was performed and the plant was stabilized in Mode 3. One Pressurizer Power Operated Relief Valve (PORV) automatically operated (two brief times) shortly after the manual reactor trip to control system pressure. This occurred because normal pressurizer spray was unavailable to restore pressurizer pressure with no reactor coolant pumps operating.

At 0939, the Instrument Air Dryer for the Instrument Air System was isolated and the Instrument Air System pressure began to recover. At 0954, the air-operated isolation valve in the cooling water flow path to the two Reactor Coolant Pumps was reopened, restoring cooling. A Reactor Coolant Pump was restarted at 1120 to prepare for transition to normal operating procedures.

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REPORTABILITY

The manual initiation of a reactor trip via the Reactor Protection System by the BVPS Unit 1 control room operator on June 22, 2001, was a valid reactor trip and was not part of a pre-planned sequence during testing or reactor operation. Therefore this event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A). The NRC was notified that a manual reactor trip occurred at BVPS Unit 1 pursuant to 10 CFR 50.72 (b)(2)(iv)(B) at 1105 on June 22, 2001.

CAUSE OF EVENT

The reason for the manual trip was the rapid depressurization of the BVPS Unit 1 Station/Instrument Air System pressure which led to the loss of Reactor Building Component Cooling Water flow to Reactor Coolant Pumps RC-P-1B and RC-P-1C. The root cause of the rapid instrument air system depressurization was mechanical aging/cyclic fatigue of the spring in a blowdown valve (1IA-288) associated with the air dryer (1IA-D-1) for the Station Instrument Air System. This failure caused the output from the operating air compressor 1SA-C-1B to be vented off rather than entering the Instrument Air System Receiver Tank, resulting in a breach of the Instrument Air System.

The Instrument Air Dryer 1IA-D-1 is a dual tower, desiccant type with automatic timed cycling. The desiccant bed in one tower dries the air stream while the desiccant bed in the other tower is regenerated by a purge of dry air expanded to atmospheric pressure. Valve 1IA-288 normally blows down the second desiccant tower to the general turbine building basement for re-generation approximately every 5 minutes when the first desiccant tower of the air dryer is placed into operation. However this blowdown valve's spring failed, causing the blowdown valve to remain open and become a breach in the Instrument Air System when the dryer swapped the second desiccant tower into operation. The spring failed due to cyclic failure. The duty cycles estimated for this valve were 600,000 when compared with manufacturer recommended level of 200,000 cycles. The blowdown valve was in service for a six year period.

A contributing factor was the lack of a preventative maintenance task for the routine inspection and maintenance of the valves on the instrument air dryer skid. Another contributing factor was an (unidentified) misoperation which occurred in the electrical supply breaker for the redundant station air compressor (1SA-C-1A). As a result of the breaker trip, the redundant station air compressor did not properly start and operate when the Station/Instrument Air System pressure began to degrade. Subsequent testing of station air compressor 1SA-C-1A and its electrical breaker did not identify any definable and reproducible reason for the electrical breaker tripping open.

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SAFETY IMPLICATIONS

Following the automatic reactor trip, all control rods fully inserted into the reactor core and all required safety systems operated as designed. Emergency Operating Procedure E-0 for Reactor Trip was performed and the plant was stabilized in Mode 3. Seal injection was maintained to the RCP seal package throughout the event.

This event was a manual reactor trip, which is less severe than the design basis event for Loss of External Electrical Load and/or Turbine Trip. The Loss of External Electrical Load and/or Turbine Trip is analyzed in BVPS Unit No. 1 UFSAR Section 14.1.7. Comparison of the UFSAR Loss of External Electrical Load and/or Turbine Trip with the June 22, 2001 event indicates that BVPS Unit 1 operated conservatively regarding the UFSAR transient in comparisons of UFSAR analysis assumptions/results. The actual plant response on June 22, 2001 was bounded by the UFSAR analysis for a Loss of External Electrical Load and/or Turbine Trip.

The plant risk associated with the BVPS Unit 1 manual reactor trip on June 22, 2001, due to a loss of instrument air pressure is considered to be low. This is based on the conditional core damage probability for the event when considering the actual component unavailabilities that were present at the time of the trip.

Based on the above, the safety significance of the manual reactor trip on June 22, 2001 was small.

CORRECTIVE ACTIONS

1. The blowdown valves on both of the dryer's desiccant towers, 1IA-287 and 288 were replaced.
2. The electrical supply breaker to instrument air compressor 1SA-C-1A was replaced since no definitive failure mechanism could be determined for this breaker opening when 1SA-C-1A started following the failure of 1IA-288.
3. Several changes were incorporated into the Abnormal Operating Procedure for a Loss of Instrument Air to enhance the performance of steps taken to restore degrading instrument air pressure conditions, prior to the restart of BVPS Unit 1 after this event. Additional procedural enhancements are also being considered for both BVPS Units.
4. The failed spring from valve 1IA-288 was analyzed by a laboratory failure analysis to aid in the root cause evaluation.
5. Preventative Maintenance items will be developed to maintain the valves and filters associated with the air dryers at both BVPS Units. This will help to ensure that these components are overhauled prior to reaching their design life.

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6. Additional air system improvements at both BVPS Units are being pursued via the Corrective Action Program in order to enhance air system operation.

Corrective action completion is being tracked through the corrective action program.

PREVIOUS SIMILAR EVENTS

A review of past Beaver Valley Power Station Licensee Event Reports found no similar events at BVPS Unit 1 or Unit 2 involving a manual or automatic reactor trip associated with the Station Instrument Air System within the last five years.